

## DESIGNING INVENTORY MANAGEMENT OF FINISHED GOODS AT PT SINKONA INDONESIA LESTARI

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*Abstract— Finished goods inventory is very important for all companies, especially companies engaged in the pharmaceutical industry, especially for PT SIL as a manufacturer of quinine and its derivatives. Finished goods inventory at PT SIL in the warehouse are beyond the normal range (> 15000 kg). Root cause analysis showed the inventory problems at PT SIL were caused by: (i) PT SIL does not have an alternative strategy of pricing in dealing a price war against competitors, (ii) marketing division cannot utilize various types of promotion in marketing the product PT SIL, (iii) supplier from cinchona bark farmers have different product standards of PTPN VIII and importers, (iv) procurement policy of raw material by marketing divisions is improper to maintain sufficient inventory level, and (v) the ability of marketing division to forecast the demand is very low. Alternative solutions obtained by analyzing the situation of the industry internally and externally, by using value chain and five forces framework by Porter to get the TOWS matrix from PT SIL and quinine industry. That will get the strategy to find an alternative solution. Based on some alternative solutions obtained, then the best business solution to resolve high inventory of finished goods are: (i) PT SIL use quality product to fight a price war, (ii) PT SIL can use certain promotional media as a marketing tool, (iii) PT SIL does counseling to the supplier of cinchona bark farmers, (iv) procurement policy of raw material by marketing divisions is proper to maintain sufficient inventory level, and (v) PT SIL can use simple moving average as a method to conduct sales planning considerations.*

*Keywords: supply chain management, quinine industry, inventory finished goods, business strategy.*

### 1. Introduction

PT Sinkona Indonesia Lestari (SIL) is a company that runs in industry producing quinine, salt of quinine and its derivatives. Factory and office PT SIL is located in the middle of the tea plantation, Ciater - Subang - West Java, and it occupies  $\pm 50\,000\text{ m}^2$  area. The installing capacity at this moment is 3300 tons skin of quinine each year. All the marketing product of PT SIL aims to be exported with the support of cinchona bark material from PTPN VIII, which has quinine plantations. PT SIL employees 288 staff and it is optimist to supply world market demand for the next 5-10 years. Quinine, as quinine salts or extracts from cinchona bark, is used as an additive in tonic type drinks, usually at a concentration of approximately 80 mg of quinine hydrochloride per liter. Such drinks are popular and have been widely consumed for almost 200 years. Quinine and its derivatives are widely used therapeutically for treatment of protozoan infections such as malaria and treatment of leg cramps.

An important issue to be discussed in this final project is the large inventory of finished goods in the warehouse located beyond the normal limit (> 15000kg) and not achieving the target of annual production by PT Sinkona Indonesia Lestari which only reached only 80%. This happens because the result of the decrease in sales volume. Author analyzed causes of problem and continued with solution to cope the root causes. These improvements are expected to improve the performance of PT Sinkona Indonesia Lestari (SIL) to facing tight competition in world.

## **2. Business Exploration**

### **2.1 Conceptual Framework**

Conceptual framework can be seen at Figure 1 in Appendix A. The production process starts from inventory on hand of raw materials in the warehouse, where the raw material is very important because it is an early stage in the production process. Factors that affect the inventory of raw material rather than how the company relies procure raw materials about how much the amount of raw material to be ordered so that the sufficiency in the production process. In determining how much the amount of raw material to be ordered rely on some other factors that are service level, safety stock, and procurement policy of raw materials. Service level is the expected opportunity to avoid stock out of raw materials. Safety stock is the amount of inventory that we must have to anticipate uncertainty. So at the time of decision-making regarding the large number of raw materials to be ordered, safety stock should be considered. If the raw materials are under safety stock should make the purchase of raw materials due to an insufficient raw materials, the production process will be disrupted. Safety stock is influenced by the delivery lead time from suppliers, so the calculations must be estimated so that the length of the delivery of raw materials to the warehouse.

Order quantity and safety stock is also influenced by how the procurement policy of the material of a company. There are several factors that influence policy in conducting the procurement of factors such as price; quantity and quality of the suppliers are in accordance with the standards of production and how the company needs to do forecasting. Delivery leads time, quality and volume and price are external factors given by the supplier. After the inventory on hand of material have been fulfilled for the production process, before heading how much production capacity that can fulfilled there are some factors that should affect the amount of production capacity, the first is how the composition of raw materials for production. This composition will affect the production planning because of the many goods that will be in production depends on the availability of raw materials. So at the time of production planning should be determined the composition of the raw material. In addition to planning the composition of raw materials influence the production planning, forecasting also affects the production planning because of all the planning massive amount of products to be produced based on the plan that is based on forecasting.

In the end, after the production process will be seen the amount of production capacity that occurs and also the goods will be entered into finished goods inventory. Amount of finished goods inventory comes from the large number of production and also how many goods are sold. Sales of its own, there are several factors that greatly affect the number of goods sold. Product quality, brand image, price policy, promotion are factors that influence the success of the sale. Besides the demand uncertainty resulting forecast made will be more difficult to predict, so that in making the forecast sales targets will be inaccurate. Target sales alone will affect how much promotional effort should be made so that the sale goes according to plan.

### **2.2 Research Methodology**

Research methodology in this research provides explanation on steps performed in this final project.

#### **1. Discovery Stage**

Discovery stage is carried out to find out what happened to the business issue at PT SIL. Business issue is happening in PT SIL has been described in the previous chapter. Data are necessary as the fact that the issue was going to PT SIL. Types and techniques of data collection are as follows:

##### **a. Primary data**

The data directly obtained by conducting by interviews and field observations. Author directly involved in daily office activity to observe how company produces the products of PT SIL. Observation was focused on planning production, processing forecast data from marketing, also how to anticipate unexpected changes and problems. The observation was done during September 2012 to March 2013. The purpose of interview is to gather all data related to planning, inventory, production, and sales of products PT Sinkona Indonesia Lestari.

b. Secondary data

Secondary data obtained through company's documents and also literature study. Literature can be about theories that are related to research, reports of scientific research that are relevant to the research, and also many information from internet.

2. Diagnosis Stage

After the data is obtained and analyzed the business issues that are going on, and then obtained the issues raised in PT SIL is a high level of inventory. To get the root cause that occur, first analysis of the business situation that is happening in the industry quinine.

3. Design Stage

Design stage is carried out to give some recommendation solutions aimed at solving problems for each of the root causes, so it will solve a very high inventory problems that occur in the PT Sinkona Indonesia Lestari.

4. Delivery Stage

This last stage is to present the conclusion and implementation of the solution will be given to the PT Sinkona Indonesia Lestari. This conclusion is to answer the objectives of the research. After that, there are several recommendations that could be is implemented to improve the performance of PT Sinkona Indonesia Lestari.

## 2.3 Literature Review

### 2.3.1 Supply Chain Management

Supply chain management is a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system wide costs while satisfying service level requirements (Simchi-Levi *et al.*, 2008). The objective of supply chain management is to be efficient and cost-effective across the entire system: total systemwide costs, from transportation and distribution to inventories of raw materials, work in process, and finished goods, are to be minimized.

There are several key issues in supply chain management, Simchi-Levi *et al.* (2008) mention there are:

- Distribution network configuration
- Inventory control
- Production sourcing
- Supply contracts
- Distribution strategies
- Supply chain integration and strategic partnering
- Outsourcing and offshoring strategies
- Product design
- Information technology and decision support system
- Customer value
- Smart pricing

This final project will discuss several key issues related to supply chain management.

### 2.3.2 Inventory Management

Inventory is the stock of any item or resource used in organization. An inventory system is the set of policies and controls that monitor levels of inventory and determine what levels should be maintained, when stock should be replenished, and how large orders should be. (Jacobs *et al.*, 2009). The objective of inventory management is to strike a balance between inventory investment and customer service.

### 2.3.3 Multiperiod Inventory Systems

Multiperiod inventory systems are designed to ensure that an item will be available on a basis throughout the year. There are two general types of multiperiod inventory systems: fixed order quantity models and fixed-time period models.

#### **2.3.4 Demand Forecasting**

There are two general approaches to forecasting, one is a quantitative analysis; the other is a qualitative approach. Quantitative forecasts use a variety of mathematical models that rely on historical data and/or associative variables to forecast demand. Subjective or qualitative forecasts incorporate such factors as the decision maker's intuition, emotions, personal experiences, and value system. (Heizer *et al.*, 2010). Time series analysis model predict on the assumption that the future is a function of the past. This model look what has happened over a period of time an use a series of past data to make forecast.

#### **2.4 Root Cause Analysis**

Before doing root cause analysis, the steps done authors first is to identify the problems that occur in PT SIL. The problem will be the symptom(s) in the cause map analysis. Negative symptom(s) were identified first to identify root cause(s). Root cause analysis was done using cause map analysis by continue asking "why" to identify root cause(s) that will finally obtained root causes in accordance with the problems faced by PT SIL. Verify cause(s) is done by matching back with facts and data also interview with assistant manager of production and manager marketing.

The first step in building the root cause map is doing interviews with the manager and assistant manager of the processing in the production division (September 2012- March 2013), the phenomenon of what is happening on the production. After conducting interviews and discussing the symptoms of the phenomenon used in the root cause analysis. After agreed upon with the assistant manager that the phenomenon is a problem faced by the production division of PT SIL, then make observations about the possibilities that lead to these symptoms. Another observation made to the division that has been linked to symptoms faced by the production divisions are PPC and Marketing. After getting the cause of these symptoms, it will get the root of the problem. The root of the problem will then be discussed again and the FGDs with the parties related to get the verify that the true root of the problem being faced by the company PT SIL.

Root cause analysis is showed in Figure 2 in Appendix B; the amount of finished goods warehouse is the main focus in this research. Based on interviews and focus group discussion with division marketing and production divisions, (September 2012- March 2013), it can be said that the number of finished goods in the warehouse is very high from the normal limit of 15000 kg and tend to increase if it is not well managed. The most influential factor to the growing number of finished goods in the warehouse is due to of not achieving sales targets planned by the marketing division. Targets are not achieved due to several factors such as inaccuracies in planning marketing division sales targets. Moreover to the decline in product sales of PT SIL provides a very significant impact.

The cause of declining sales due to issues such as the quality of the products PT SIL itself. The products qualities are unstable suspected as the trigger of a decline in sales. The numbers of complaints that go to PT SIL regarding PTSIL product degradation, cause a reduction in consumer trust in product quality PT SIL.

Availability of appropriate standards of cinchona bark production in the warehouse is not sufficient for the production process, so that the PPC division planning to make changes to the composition of cinchona bark mixing process, which should be a mixture of cinchona bark from PTPN, more than imports of cinchona bark, to be otherwise. This leads to the result of the extraction process will result in inconsistent levels. Moreover problem of availability, the production division cannot meet the plan production schedules (quinine salt production under Target Monthly Production Plan 27.78%). Therefore, achieving annual production quinine salts of PT SIL can't hit the target. Besides the decline in sales and availability of appropriate standards of cinchona bark production in the warehouse is not sufficient for the production process, resulted in a change RKAP, which will affect the annual production target to be achieved by PT SIL.

#### **2.4.1 PT SIL does not have an alternative strategy of pricing in dealing a price war against competitors**

Price competition between PT SIL and competitors because of quinine industry competition is tight. This competition is one factor in the decline in sales experienced by PT SIL. Being in the oligopoly market in which all the elements associated with it are in the market economy oligopoly start of production, distribution, or consumption. All companies that compete in the quinine industry, relies heavily on the market that is played by PT SIL and its competitors, so that the expected profit from the sale was difficult to achieve.

Based on the results of interviews with marketing manager (March 2013), in principle in determining the price for the product PT SIL based on: the internal (cost), external (inflation and tax), market price and estimated profit. All aspects of the internal (direct cost and indirect cost) plus external (inflation, taxes and rates) and percentage of estimated profit, that will form as the base price. This base price will be the consideration of marketing division to sell products with a look at in the market price situation.

Selling price set by PT SIL is usually based on the market price because the business situation oligopoly pricing should be very careful, but at a certain period of time such as during the summer when demand is high quinine, PT SIL sells above market price. PT SIL never sell goods in accordance with the base price to the consumer as long as the marketing division to guarantee that the consumer will make repeat order, because to sell products at prices equal to or less than the base price difficult to get approval from the board of directors. PT SIL had to face Buchler nearest competitor on price and quality and several other pharmaceutical companies like India companies, are actively offering goods at low prices, but with quality under PT SIL.

#### **2.4.2 Marketing division cannot utilize various types of promotion in marketing the product PT SIL**

Promotion is an important part of the sales process which aims to influence customers or potential customers to use the products or services they sell. Marketing division cannot utilize various types of promotion in marketing the product marketing division thus causing innovation in selling the products is still limited, so the promotion has not done optimally. As a result PT SIL has decline in sales because of the lack of innovation in the promotion.

Promotional efforts undertaken by the marketing department is not too big because marketing division just promotion by offering via email or phone to consumers who use the products of PT SIL. Before the European crisis in 2008, the promotional efforts undertaken by PT SIL is not too big, because demand is still high at that time and the consumer is in a race to do research and development on materials quinine as supplementary material for requirements the pharmaceutical, healthcare and food and beverages industry. After the European crisis, consumers began to be careful in doing research and development so that demand is declining because previous quinine promotional efforts undertaken by PT SIL is not too big, now PT SIL consequently difficult to find consumers that sales had come declining and consumers are previously always buy quinine on PT SIL started turning to producers who have lower prices in order to save the cost of their production.

Moreover the promotion they are doing that is through the role via an agent that offers the product PT SIL spread in several areas. Also PT SIL has occasionally followed the exhibition held by the government.

#### **2.4.3 Supplier from cinchona barks farmers have different product standards of PTPN VIII and importers**

PT SIL took cinchona bark raw material from three different suppliers. Cinchona bark coming from the three suppliers will be checked by the quality assurance division to known levels through laboratory processes. Level of cinchona bark is used in the production process 3.1%. Before the processing, cinchona bark going through the mixing process that will get the quality or level which is ideal for the production process.

Availability of cinchona bark in accordance with the standards of production in the warehouse is not sufficient would disrupt the production process because it will result in a change in the composition of the planning process of mixing cinchona bark. This is because the good quality of cinchona bark obtained PT SIL just came from PTPN VIII and Importer, while the cinchona bark particularly from farmers do not all quality of standard production at during the process laboratory test, this is caused suppliers from cinchona bark farmers have different product standards of PTPN VIII and importers.

#### **2.4.4 Procurement policy of raw material by marketing divisions is improper to maintain sufficient inventory level.**

In purchasing or ordering raw materials cinchona bark, PT SIL did with the contract system, especially with importers and PTPN VIII. Contract made with PTPN VIII as one shareholder in PT SIL, PTPN VIII mandatory to supply the cinchona bark every month. Number of cinchona bark is determined by PTPN VIII itself in accordance with their capabilities. The amount provided by PTPN VIII ranged up to 20000 kg-30000 kg cinchona bark. For the quality, PTPN VIII is a supplier which has the best quality among other suppliers.

System PT SIL contract made by the importer in the form of the contract price and quality. PT SIL will order from importer per month based on the production plan has been made before or when the stock is up or does not meet the minimum level of cinchona bark which should be available in the warehouse. Amount of orders are always changing due to PT SIL does not have fixed safety stock that is sure to make a reservation of raw materials. Minimum amount of which should be available also vary depending on the production plan.

#### **2.4.5 The ability of marketing division to forecast the demand is very low.**

In forecasting PT SIL uses historical data as a reference with based on experience. PT SIL also make an offer directly to consumers, so that the sum of the orders requested by the consumer be taken into consideration to estimate one month ahead, so PT SIL can predict the approximate amount of demand for their products.

### **3. Business Solution**

Before determining the right solution for each root of the problem, the first step was to analyze the quinine industry own business both internally and externally of PT Sinkona Indonesia Lestari. Business solution can be seen in Figure 3 in Appendix C, the steps to get the possibilities of solutions that will be used to solve the root of causes.

#### **3.1 Alternative of Business Solution**

After do the root causes analysis to get the root causes as described in the previous chapter, next is to do business analysis will be done internally and externally. To analyze internally, the authors use a porter value chain analysis, which results in strengths and weaknesses of PT SIL itself. As for the external analysis, author used porter five forces to get the possible threats and opportunities from the industry environment.

Porter's five forces is a framework for analyzing industries and develop business strategies. The five forces combined to see the impact of an industry competition. SWOT analysis is a technique to provide a framework for systematically identifying the position of the company; way related to the company's external and internal environment. The TOWSMatrix proposed as a conceptual framework for a systematic analysis that facilitates matching the external threats and opportunities with the internal weaknesses and strengths of the organization. The results obtained by using the TOWSMatrix are strategic alternative. After getting strategic alternatives, then look for possible solution by looking at the relationship between strategies with the root causes that exist, so it would appear possible solution to solve the root causes.

### **3.1.1 PT SIL has an alternative strategy of fighting a price war against competitors.**

In general, price wars occur because there is a presumption that the price is too high in certain markets or the desire to gain market share by using a strategy of pressing the profit margin. PT SIL does not have an alternative strategy to face a price war with its competitors. Meanwhile business situation that occurred at PT SIL is oligopoly business situation; causing price sensitivity. Moreover, the European crisis is also influential in policy making by PT SIL in pricing. The strategy can be done by PT SIL include compete on quality, using various complex price action and the make cooperation with similar companies. This strategy can be used by PT SIL because PT SIL has strength in terms of brand image and also quality products owned by PT Sinkona Indonesia Lestari (SIL) good known by competitors and consumers.

The strategy can be used by PT SIL is as follows:

- Compete on quality

Build awareness of the importance of the quality of a product is the thing that should be improved by PT SIL because pharmaceutical products already have rules and regulations in each product unique. In addition to building awareness about the quality of goods, PT SIL can also educate about the risks if we buy goods at low prices. Cheap price sometimes is not always directly proportional to the quality. In the pharmaceutical industry the quality is very important and should not be tolerated if there is an error. PT SIL can make a profit by doing education, so that the consumers are not easily tempted by cheap prices provided by competitors.

- Co-opt contributors

PT SIL can improve relationships with business partners to suppliers and agents. Supplier is an important element in the quinine industry, due to raw material producers in the world quinine not so much. Relationships of cooperation between PT SIL with suppliers are crucial to the smooth running of the company's production process due to its dependence on various things such as raw materials and services. Therefore build a harmonious relationship with suppliers as payment for example according to the contract would be beneficial to both parties.

Agent is one of the cutting edges in terms of sales at PT SIL due to the function of the agent itself such as connecting business transactions PT SIL and end users who require quinine products, as well as other promotional media for consumers who need but do not know the PT SIL itself. In building a good relationship with the agent, PT SIL can provide higher commission or bonus if there is an agent that managed to increase their sales.

- Use complex price actions

- a) Discounts quantity.

Quantity discounts would be obtained if consumers buy in large quantities. PT SIL can give price variations if the volume purchasing very large, then the consumer can get the price the relatively lower. The purpose of the quantity discounts are giving discounts offered by PT SIL to encourage consumers to be willing to buy in larger quantities so as to increase sales.

- b) Price specials to consumers who loyal.

Granting special prices is one an award to its consumers who already loyal, besides it can increase the relation between PT SIL with consumers directly.

- Cooperate with Rival

The main rival PT Buchler SIL is come from German, the competition in the form of price and quality. Buchler has more value because; Buchler has a longer experience than PT Sinkona Indonesia Lestari (SIL). Quality products owned by Buchler better than PT Sinkona Indonesia Lestari (SIL) and the price given to the consumer at the PT Sinkona Indonesia Lestari (SIL). Other pharmaceutical companies also produce quinine with more varied products and sell quinine at a cheaper price but quality under PT Sinkona Indonesia Lestari (SIL).

Position PT SIL can be said to be strategic because it is among the competitors. PT SIL can cooperate with its closest competitor, namely Buchler (Germany). Due to two major competitors could be said, of the cooperating tends to be quite difficult to create but did not rule also will be formed. Form of cooperation to do that in terms of making a deal price or sharing marketing intelligence. Making an

agreement intended to allow the price relatively stable market price and the market leader in the industry quinine salts, Buchler and PT SIL can control their finances, although resulting in a smaller profit margin.

### 3.1.2 PT SIL Can Do Marketing by Using the Promotional Mix as a Promotional Media

PT SIL not utilizes different types of media campaigns in promoting their products. As one of the companies that produce quinine and its derivatives, PT SIL already has a strong brand image but unfortunately it is not accompanied by a vigorous campaign, while many industries are starting to use quinine as raw materials such as food, beverage, cosmetics, and pharmaceuticals that create increased demand for quinine. Therefore, PT SIL can do education about the usefulness of quinine products to consumers and potential consumer and maximizing the use of media in conveying quinine promotional products to consumers. *Promotional mix is a specific combine of advertising, public relations, personal selling, sales promotion, and direct marketing* (Armstrong and Kotler, 2009) and these tools are employed to communicate to consumers thus helps to form their belief and attitude towards the offerings (Rabaah Tudin and Anne Wong Ling Ling, 2012)

#### a. Advertising

Advertising is one way to promote a product or service has a goal as the awareness that the PT SIL was there as one of the companies in the world that produces quinine. In addition, advertising can also be brief information that aims to persuade consumers to buy the product of PT SIL. A shortcoming as a media campaign is that advertising just one way promotion, where consumers can not directly find out more information.

This type of advertising that can be done by SIL can be pressed on a website banner with Kimia Farma as the holding company because Kimia Farma is a company that already has a brand image in the international community. In addition, to maximize the role of the internet to create a website as attractive as possible so that PT SIL with consumers who will seek products quinine would be more interested in the product PT SIL and also get information about the products sold by PT SIL itself. At this time PT SIL has had to address the company's website <http://sinkona-indonesia.com/> but the content within the website is still less attractive when compared to its competitors.

#### b. Direct Marketing

Direct marketing is a media campaign that offers products or services directly to consumers, thus forming a more personal communication. Example of direct marketing that can be done by PT SIL is participating in the pharmaceutical exhibitions nationally and internationally. The exhibition PT SIL, will know directly who will be consumers and can also add to the prospective consumers by giving out information directly. Examples include the pharmaceutical industry exhibition IPEX (Indonesia Pharmaceutical Expo), Indian Pharma Expo 2013, IPHEX 2013 (India), In-Pharma Japan 2013 etc.

In addition to the exhibition PT SIL can use electronic mail or telephone as a medium to carry out direct marketing as used in the current instance informs the usual products purchased by consumers have available or information regarding the price promotion.

#### c. Sales Promotion

Sales promotion is one of the media campaign in which companies use price to attract consumers to buy the product or service they offer. Discount is one that sales promotion is commonly used by every company in order to promote sales, PT SIL can offer discounts to consumers who buy their products with large volume. Provide additional commission is also one of the media promotions given to an agent of PT SIL. With the additional commission will strengthen the relationship between the agent and the company.

#### d. Publicity & Public Relations

Publicity and Public Relations aims to measure the existence of the company and its products in the market, but it served to establish a brand image in the eyes of consumers. Publicity can be done by PT SIL them are featured in business magazines or magazines about the world of pharmaceuticals such as Pharma Magazine etc.

#### e. Personal Selling



Personal Selling is a campaign where the company will be dealing directly with consumers. Promotions like this usually when the company was asked to present their product in front of consumers. PT SIL should be able to present the company and their products as possible, so as to convince consumers that are interested in buying their products and can also build relationships with consumers better.

### 3.1.3 PT SIL can visit and educate local farmers of cinchona barks

Supplier of Cinchona Bark Farmers has different standards of standard products PTPN VIII and Importers. As we know earlier, that the raw material cinchona bark almost entirely from importers and also PT SIL always rely on importers who do have the cinchona bark in large enough quantities, but it actually has the quality is not too good. By utilizing the opportunities on geographical conditions in the state of Indonesia which is very supportive for the crop quinine, which can increase the quinine plantation industry in Indonesia and PT Sinkona Indonesia Lestari (SIL), will get the raw materials from domestic. Strategies that can be done by PT SIL are encourage farmers to plant quinine as one commodity and collaboration with PTPN VIII provides superior seed quinine to farmers and also empower and optimize local supply to reduce the cost of raw material shipments from importers.

### 3.1.4 PT SIL can use inventory model to calculate order quantity and safety stock

In conducting the procurement policy cinchona bark, PT SIL is usually performed every month with the amount varying depending on production plans made by the PPC division. The factors that influence policy in determining how much quantity to be ordered is only by planning production plus inventory on hand, so that PT SIL only be ordered according to need without seeing any other factor. It can be seen that the inventory is almost always below the production plan. This will result in disruption of the production process. Then the solution to overcome this problem, the author makes the order quantity based on service stock and service level. Order quantity can be calculated by the following formula:

$$q = \bar{d}(T + L) + z s_{T+L} - I \quad \dots(1)$$

$$ss = z s_{T+L} \quad \dots(2)$$

q = quantity to be ordered

T = the number of time between reviews

L = lead time

$\bar{d}$  = average demand

z = number of standard deviations for a specified service probability

$s_{T+L}$  = standard deviation of demand over the review and lead time

I = current inventory

By using the formula (1) and (2) the results obtained in the following table:

Table 1 Order quantity and inventory of cinchona bark

Service Level	z	q	Inventory
95%	1.6 4	31,893.82	131,814.51
96%	1.7 5	42,468.68	142,389.36
97%	1.8 8	55,469.11	155,389.80
98%	2.0 5	72,750.92	172,671.61
99%	2.3 3	99,989.20	199,909.88

Based on Table 1, with a safety stock of 99,920.69 kg and service level by 95%, PT SIL required to order as much as 31,893.82 kg cinchona bark in order to avoid shortages of goods each month, so the inventory that should be available in the warehouse around 131,814.51 kg. When using a service level of 99%, PT SIL required to order as much as 99,989.20 kg cinchona bark in order to avoid shortages of goods each month, so the inventory that should be available in the warehouse around 199,909.88 kg.

### 3.1.5 Marketing division can improve the ability to forecast demand for products of PT SIL by using a forecasting method.

With uncertain demand, it will be difficult to establish their sales targets, because the inaccuracy that production is not directly proportional to sales. To solve this problem PT SIL can improve the ability to forecast demand by using a forecasting method. To overcome the problem of the magnitude of the difference between planned and actual sales, then one solution which can be done by the marketing division of PT SIL is a forecasting with the help of forecasting methods. The method can be used in this research is the simple moving average and regression analysis.

By using the software Minitab results obtained from calculations using a simple moving average method by using three long months and four months. The result can be seen in table 2 it can be said that based on the value of MAPE found that by using a simple 3 month moving average of the error is about 17% while using the 4 month simple moving average value of 14%. MAPE is a measure perhaps the easiest to interpret. MAPE is very low clear a statement that is not dependent on issues such as the magnitude of the input data. MAPE expresses the error as a percent of the actual values, undistorted by a single large value. So we can conclude forecasting error using this method is very small and it ranged between 17% by using a 3 month simple moving average and 14% by using a 4 month simple moving average.

Table 2 Accuracy using simple moving average

3 Month Simple Moving Average		4 Month Simple Moving Average	
Accuracy	Measures	Accuracy	Measures
MAPE	17	MAPE	14
MAD	1376	MAD	1204
MSD	3230000	MSD	2426764

Simulation is then performed using several methods to make changes to the sales variable; the results of these simulations can be seen in Table 3 in Appendix D. It can be seen that sales are declined and not hit the target resulting in very high inventory of finished goods, if in accordance with the plan of selling the finished goods inventory will tend to be slightly even run out. Problem of shortage of finished goods is not an issue for PT SIL, due to the planned increase in production capacity by adding new equipment and technologies in the production process.

Likewise, the simulations are carried out by several methods, such as the use of forecasting the simple moving average method, regression analysis, using the average of the production and also the use of the average production per year can be seen that the inventor of finished goods does not exceed the normal range is > 15000 kg even more PT SIL likely to be able to increase production capacity because of the possibility out of stock. Therefore in planning sales of not only using historical data and experience as a reference only but also be able to use some forecasting methods such as the author did. To increase sales would be supported by a strategy-good marketing strategy and precise stacking of finished goods so that problems can be avoided because the maximum sales.

## 3.2 Analysis of Business Solutions

### 3.2.1. PT SIL use quality product to fight a price war

In the face of business situations with a price sensitivity in it, the solution can be directly used by PT SIL are competing against competitors by promoting quality products. PT SIL itself already has several licenses and certificates as required to be owned by pharmaceutical companies. By providing information to consumers that quality is an important aspect especially for the pharmaceutical industry and food beverages, PT SIL can educate the consumer that low prices will not guarantee the production will be good. Although PT SIL will eventually lose customers who have low purchasing power but for loyal customers and also consumers who are concerned with the quality of the product, at the time of PT SIL is still can make a profit from the sale rather than having to compete directly through price wars.

### **3.2.2 PT SIL can use certain promotional media as a marketing tool**

Media campaigns can be directly carried out by PT SIL is how to advertise their products. Effective media campaign to advertise for PT SIL is how to optimize information technology has advanced. Making the website attractive and also contains information and data on PT SIL and its products can attract consumers to buy the products of PT SIL

In addition to utilizing advertising, PT SIL can also do personal selling like visiting their official agents to look directly what their end users, so that consumers know that PT SIL was indeed in existence. Direct marketing is still very useful for PT SIL such as electronic mail, telephone or occasionally following exhibitions both nationally and internationally.

### **3.2.3 PT SIL does counseling to the Supplier of Cinchona Bark Farmers**

The largest raw material supplier PT SIL comes from South Africa but the quality is not as good as that produced by PTPN VIII, the problems encountered is the supply of cinchona bark PTPN VIII although of good quality but the quantity is not sufficient for the production of PT SIL while cinchona bark from the rank and the quality is not too good but the quantity is more than PTPN VIII useful as a supplement in case of shortages of raw materials.

Therefore the form of education in the form of education as he had done previously, and also the provision of quality seeds by PTPN VIII can be held back and done regularly to areas that are still producing crops quinine. With this kind of activities performed, quality of cinchona bark is not only owned by PTPN VIII and importers, but also by cinchona bark farmers. If the entire supplier PT SIL has the same quality of goods that will be used in the production process, the quantity of cinchona bark in the warehouse is appropriate with the standards of production, so that cinchona bark was wasted, during the process of filtration is reduced and the availability of appropriate cinchona bark in warehouse production standards sufficient to process production.

### **3.2.4 Procurement policy of raw material by marketing divisions is proper to maintain sufficient inventory level**

Based on the calculations have been carried out, showing that the order is not the lack raw materials in the warehouse the order quantity to the marketing division had to order as much as 99,989.20 per month with a service level of 99%. Since the average monthly use of cinchona bark  $\pm 200,000$  kg. Then the safety stock inventory of 99,920.69 kg of the cinchona bark which is in the warehouse will be in the range of 199,909.88 kg.

### **3.2.5 PT SIL can use a simple moving average as a method to conduct sales planning considerations**

Based on the simulations that have been carried out the most probable scenario is by using a simple moving average using either three or four months as the essence of time, due to the error obtained by this method are quite small, namely 17% and 14%. By using the method can be seen that as finished goods inventory would have stock outs, but this is not a problem for PT SIL, because PT SIL is planning to increase its production capacity by adding a new machines, so it possibility of will run out of goods can be avoided.

In designing inventory management, simulation is carried out using the best forecasting method is the simple moving average on the basis of three and four months as a baseline. After replacing the sales

data with data from the forecasting, simulation production data to make changes using two scenarios are possible. To get the amount of inventory in the warehouse to be sufficient, then the calculation is done by adding the beginning inventory with production quantities for the month produced is then reduced by the amount of the sale, it will get the end inventory.

Simulation for determining the amount of the production is done in two ways, the first is to establish that production of every month based on prognosis in 2011 is equal to 7000 kg and the second scenario is still using the prognosis in 2011 but at month 13 (next year), capacity production increased in accordance with RKAP production division around 9500 kg per month. The simulation can be seen in Table. 4 in Appendix E.

Based on Table 4 can be concluded to obtain a stable inventory of finished goods are minimum 10,000 kg and not more than the standard limit production division can use the second scenario both use the three-month simple moving average or a four-month simple moving average. The maximum value of inventory acquired is almost close to 13 000 kg it is still below the maximum limit in the warehouse. With this the PT SIL can use forecasting using three or four months with the simple moving average method with production plans ranging between 6000 - 9500 kg every month in order to inventory finished goods remains but the capacity is not too excessive.

#### **4. Conclusion and Implementat ion Plan**

##### **4.1 Conclusion**

The problem at PT Sinkona Indonesia Lestari is the large inventory of finished goods in the warehouse located beyond the normal limit (> 15000kg) and not achieving the target of annual production by PT Sinkona Indonesia Lestari which only reached only 80%. This happens because the result of the decrease in sales volume. There was a strategic business problem related to high inventory of finished goods in PT Sinkona Indonesia Lestari. Root causes of the problems were:

1. PT SIL does not have an alternative strategy of pricing in dealing a price war against competitors.
2. Marketing division cannot utilize various types of promotion in marketing the product PT SIL.
3. Supplier from cinchona barks farmers have different product standards of PTPN VIII and importers.
4. Procurement policy of raw material by marketing divisions is improper to maintain sufficient inventory level.
5. The ability of marketing division to forecast the demand is very low.

Solutions to cover those causes were:

1. PT SIL use quality product to fight a price war.
2. PT SIL can use certain promotional media as a marketing tool.
3. PT SIL does counseling to the Supplier of Cinchona Bark Farmers.
4. Procurement policy of raw material by marketing divisions is proper to maintain sufficient inventory level.
5. PT SIL can use a simple moving average as a method to conduct sales planning considerations.

The solution given is aiming to increase sales volume by the marketing division and in order to achieve an annual production target. By conducting simulation process between the sales plan by using a simple moving average forecasting method and production plans will be seen collaboration between the production plan and sales forecasting plan to obtain finished goods inventory is stable and can meet the demand of consumers.

##### **4.2 Implementation Plan**

Since the solution is at operational level, it did not require plenty of time and expenditure, but there are some steps that are needed to be considered in implementing business solutions above.

1. Socialization

Socialization is necessary so that each division and the employees involved in the process of understanding the procedure so that during the process is no confusion later. Socialization process needs approximately one week before technical preparations.

## 2. Technical preparation

Technical preparations are needed to support the success of implementation process. New methods for marketing division are to learn how to get order quantity and forecasting. Employees that are directly responsible to this process might need time to learn how to apply a new method. At this stage also conducted the renewal of the policy document that will be implemented. This preparation process require approximately three weeks.

## 3. Trial implementation

After accomplishing socialization and technical preparation, management should conduct trial implementation. This stage will provide experience to employees regarding the new processes that will try to apply. Trial implementation needs approximately three months.

## 4. Evaluation and improvement process

During and after trial process is conducted, evaluation of the process to analyze the performance and obstructions during the trial. Analysis can be used to make improvement on implementation process. This preparation process require approximately two weeks.

## 5. Implementation

After a complete analysis and improvement of the implementation process, business solutions can be implemented.

### 4.3 Future Research

There are several future studies that PT SIL can do in improving their ability to manage their inventory and business strategy, there are:

1. Pricing strategy in the circumstances a price war may be calculated in order to get the price that can be done by PT SIL. To get the right price, can be calculated in detail based on the income statement and balance sheet of PT SIL, in order to get direct cost and indirect cost to get further calculations in pricing.
2. Innovation for promotion is not limited based on promotional mix. To get right promotion, there are many methods to get them. Integrated Marketing Communication can be implemented to looking at whole aspect of promotion.
3. Further research could use the inventory model allows then performed simulation, so in order to determine the amount of raw materials more accurately.
4. The focus of research in improving the accuracy of forecasting, especially demand forecasts for each product. Besides that simulation can be included variable costs in order to get a more precise solution.
5. Simulation of inventory can use Monte Carlo simulation, which uses a certain distribution in performing simulation.

### References

- Heizer, J., and Render, B. (2011) *Operations Management*, 10<sup>th</sup> Ed., Pearson Education, Inc, New Jersey.
- Jacobs, R., Chase, R. and Aquilano, N. (2009) *Operations & Supply Management*, 12<sup>th</sup> Ed., McGraw-Hill, New Jersey.
- Rao, A., Bergen, M. and Davis, S. (2000) 'How to Fight a Price War', *Harvard Business Review*, pp. 107-116.
- Simchi-Levi, D., Kaminsky, P. and Simchi-Levi, E. (2008) *Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies*, 3<sup>rd</sup> Ed., McGraw-Hill, New Jersey.
- Turidin, R., and Wong Ling Ling, A., (2012) 'Promotion Mix: Level of Awareness and Purchase Likelihood', *Faculty of Economics and Business, Universiti Malaysia Sarawak (UNIMAS)*, FEB Working Paper Series No. 1201.

## Appendix A

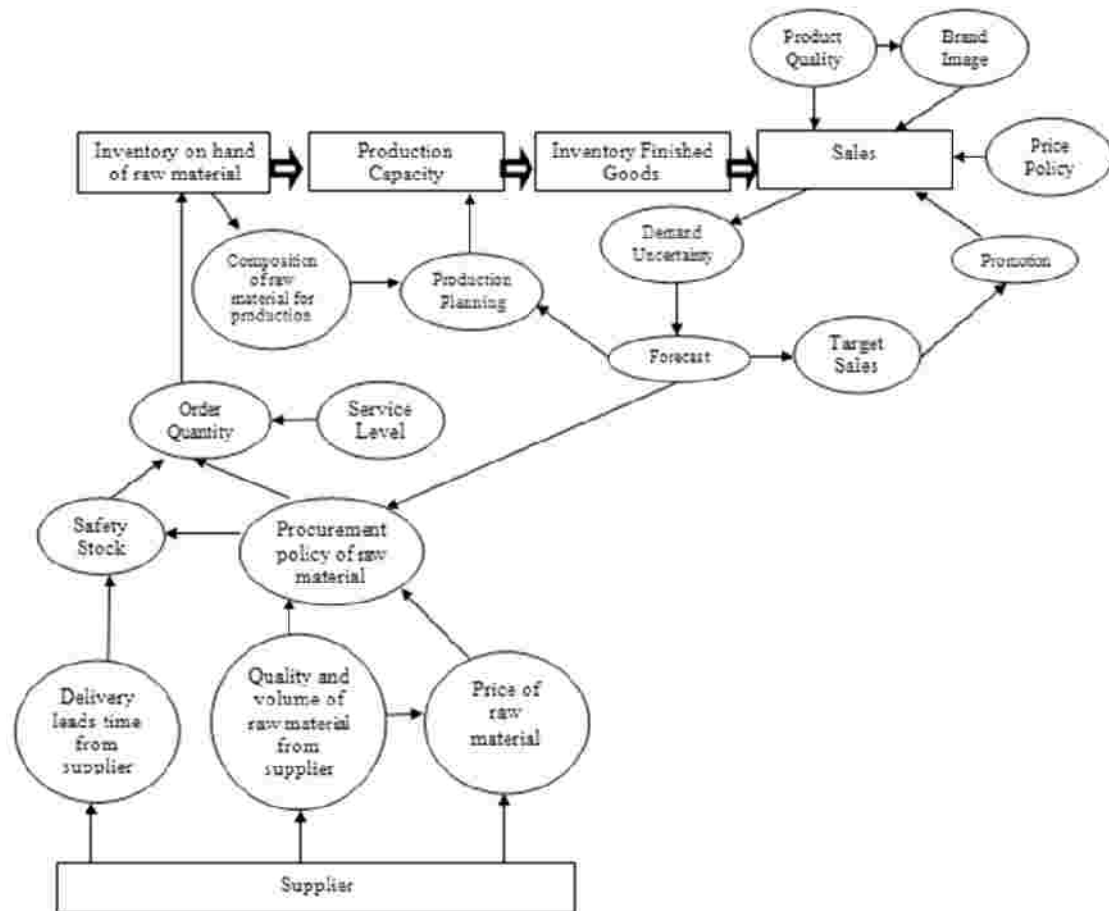


Figure 1. Conceptual Framework



